

THE GENUS ESCHWEILERA IN TRINIDAD AND TOBAGO

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IN HIS Flora of Trinidad and Tobago, R. O. Williams (1: 353. 1934) recognizes two species of *Eschweilera* (Lecythidaceae), one occurring in Trinidad and one in Tobago. The present writers, although agreeing with Williams in referring the common lowland Trinidad form to *E. subglandulosa*, believe that a species occurring in the montane rain-forest of Mt. Tucuche is undescribed. Furthermore, we cannot concur in referring the Tobago plant to *E. decolorans* Sandwith, of British Guiana; this Tobago entity appears to us to be undescribed and below we present a description of it. Although the authors of this paper are jointly responsible for the conclusions expressed, the formal descriptions and the synonymy were prepared by the first author, while the second author assembled the ecological data, largely on the basis of his own field-study.

Herbarium specimens are cited from the Arnold Arboretum (A), Gray Herbarium (GH), Imperial College of Tropical Agriculture, Trinidad (ICTA), New York Botanical Garden (NY), Royal Botanic Garden, Trinidad (Trin), and U. S. National Herbarium (US). We are indebted to the directors and curators of those institutions from which material has been borrowed for the purposes of this study.

Eschweilera subglandulosa (Steud.) Miers in Trans. Linn. Soc. 30: 266. 1874; Eyma in Pulle, Fl. Surinam 3 (1): 134. 1934; R. O. Williams, Fl. Trin. & Tobago 1: 253. 1934; Knuth in Pflanzenr. 105 (IV. 219a): 106. 1939.

Lecythis subglandulosa Steud. ex Berg in Linnæa 27: 459. 1854.

Lecythis laevifolia Griseb. Fl. Brit. W. Ind. 711, nomen. 1864; Urban in Bot. Jahrb. 19: 670, nomen. 1895.

Eschweilera laevifolia Miers in Trans. Linn. Soc. 30: 256. pl. 60, f. 15. 1874; Knuth in Pflanzenr. 105 (IV. 219a): 99. 1939.

TRINIDAD: Arena Reserve, alt. 75 m., Beard 148 (A) (tree 40 m. high, in evergreen seasonal forest; trunk 60 cm. diam.; petals cream-yellow; timber useful; local name: *guatecare*); North Post Road, Britton, Hazen, & Mendelson 773 (GH, NY, US) (tree 20 m. high, on hillside); St. Anne's Valley, Broadway 3620 (Trin); without locality, Fairchild 2857 (A).

On the basis of the cited material and examination of the original and subsequent descriptions, we are inclined to agree with Williams in reducing *E. laevifolia*, presumed to be endemic to Trinidad, to the South American *E. subglandulosa*. No differences are apparent between our specimens and several available from British Guiana. In his recent work, Knuth makes no comparison between the two species, both of which are maintained by him.

Eschweilera subglandulosa ("guatecare"), as it occurs in Trinidad, is a large evergreen tree up to 40 m. in height, with a long cylindrical erect trunk up to 75 cm. (or occasionally more) in diameter, branching high up, and

with small buttresses. The bark is dark gray to black, somewhat smooth, about 0.5 cm. thick, hard, and slightly fibrous. The wood is white, turning gray when seasoned; it is close-grained and without distinct heartwood. The timber is very hard, heavy, and difficult to work; it is usually hewn rather than sawn into sleepers, posts, and heavy timbers. It is prized for its natural durability in contact with the ground, being resistant to both fungi and termites.

This species is one of the principal dominants of the most widespread forest type of the Trinidad lowlands-evergreen seasonal forest — and has given its name to the *Carapa guianensis*-*Eschweilera subglandulosa* association of that formation. It is absent from Tobago. In the foothills of the Northern Range of Trinidad (a) it is only of the order of frequent, but it is abundant in the forests of the northern plain (b) and Central Range (c), and it is very abundant on the southern hills and penecplain (d). It becomes abundant also in a drier type of forest in the southern hills, the *Peltogyne porphyrocardia*-*Mouriria Marshallii* association of semi-evergreen seasonal forest (e). It does not become such a large tree in the semi-evergreen forest, while in other forest types than the five mentioned above the tree is casual and rare.

TABLE 1.

NUMERICAL OCCURRENCE OF *ESCHWEILERA SUBGLANDULOSA* IN FOREST TYPES
IN TRINIDAD; INDIVIDUALS PER 100 ACRES

Locality	Number of trees in girth classes (girth in feet)										Totals
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	over 10	
a ¹	38	12	4	4	6	2	2	—	—	—	68
b	194	116	54	54	26	12	6	2	—	6	470
c	108	69	35	30	20	2	6	1	1	1	273
d	234	366	201	231	87	48	21	21	6	3	1218
e	100	136	22	24	14	—	—	—	—	—	296

¹ The letters in the left-hand column refer to the localities mentioned in the text above.

The habitat of the plant is characterized by a seasonal rainfall regime with from 1750 to 3000 mm. of rain annually, distributed in a dry season from January to April, with 50 to 80 mm. of rain per month, and a rainy season from May to December, with 100 mm. and upward per month. Mean annual temperature is about 78° F. There is little exposure to strong winds. Topography embraces all types from mountains to plains, and soil types include all except the extremes of excessively freely drained and waterlogged. Apparently the tree occurs in British Guiana in a similar habitat.

Eschweilera subglandulosa is a forest dominant in the sense of physical and numerical superiority, being one of the most abundant trees of the uppermost forest stratum. It is not uniformly distributed, since the *Carapa-Eschweilera* association is divisible into two distinct alternes corresponding to site differences between ridge and flat. *Carapa* is dominant on the badly drained flats with intermittently high water-table — *Eschweilera* on the dry ridges with compact soil and no true water-table. On intermediate sites both dominants occur together. Associate dominants of the *Eschweilera* alterne are *Buchenavia capitata* (Vahl) Eichl., *Terminalia amazonia* (J. F. Gmel.) Exell, *Tabebuia serratifolia* (Vahl) Nichols., *Manilkara bidentata* (A. DC.) Chev., *Vitex divaricata* Sw., *Vitex capitata* Vahl, and *Bravaisia integerrima* (Spreng.) Standley.

Eschweilera trinitensis sp. nov.

Arbor 10–20 m. alta ubique glabra, ramulis subteretibus rugulosis primo purpurascensibus gracilibus 1.5–5 mm. diametro demum cinereis lenticellatis; petiolis canaliculatis valde rugulosis 5–13 mm. longis crassis (2–3 mm. diametro); laminis coriaceis vel valde chartaceis in sicco olivaceis ellipticis vel oblongo-ellipticis, (7–) 10–26 cm. longis, 4–12 cm. latis, basi obtusis vel subrotundatis et in petiolum leviter decurrentibus, in apicem callosum 0.5–1.5 cm. longum cuspidatis, margine cartilagineis integris vel obscure undulatis, costa supra plana vel subprominente subtus valde prominente, nervis secundariis principalibus utrinsecus 7–14 arcuato-ascendentibus marginem versus obscure anastomosantibus supra planis vel prominulis subtus valde elevatis, rete venularum copiose intricato supra immerso vel prominulo subtus valde prominulo; inflorescentia axillaris vel subterminali sub anthesi 6–12 cm. longa anguste paniculata ut videtur ad 25-flora, rhachi angulata valde rugulosa 2–4 mm. crassa haud flexuosa, ramulis lateralibus 2–8 ascendentibus ad 3 cm. longis gracilibus; pedicellis teretibus haud bracteolatis 5–8 mm. longis superne 2–3 mm. diametro, basi valde contractis et articulatis, parte inferiore persistente subnulla in pulvino bilobato inconspicuo complanata; calyce sub anthesi ad 12 mm. diametro, sepalis subcoriaceis semiobiculari-deltaideis circiter 4×5 mm. subintegris obtusis; petalis tenuiter carnosis vel in sicco papyraceis ellipticis vel oblongo-obovatis, sub anthesi ad 2 cm. longis et 1.5 cm. latis, obscure nervatis, apice rotundatis, margine obscure denticulatis vel integris; androphoro carnosio explanato circiter 2 cm. longo, super annulo circiter 12 mm. lato, galea spiraliter incurvata circiter 13 mm. lata, parte apicali inflexa extus appendiculis crassis acutis 3–5 mm. longis ornata; staminibus circa annulum et paulo supra numerosissimis, filamentis carnosis subteretibus 0.7–1.2 mm. longis superne incrassatis, antheris oblongis 0.5–0.7 mm. longis; ovario semisupero sub anthesi circiter 3 mm. diametro, in stylum brevem conicum truncatum ad 1 mm. longum umbonato, loculis 4, ovulis in quoque loculo e basi erectis ut videtur 3 (2–4?); inflorescentia sub fructu valde incassata, pedicellis ad 5 mm. diametro; pyxidio maturo depresso-subgloboso ad 4.5 cm. longo et 5.3 cm. lato, parte infracalycari cupuliformi 2–2.5 cm. alta rugulosa, calycis lobis coriaceis obviis obtusis, vitta interzonalis incurvata 3–9 mm. alta, operculo convexo 5–10 mm. alto ad 4 cm. diametro, pericarpio lignoso 3–4 mm. crasso 2–4-loculari, seminibus in quoque loculo 1 vel 2 ad 3×2 cm.

TRINIDAD: El Tucuche, in montane rain-forest, alt. 900-1000 m., *J. S. Beard* 147 (A, TYPE), Oct. 1, 1943 (tree 15 m. high; trunk 30 cm. diam.; flowers yellow; local name: *mountain guatecare*), *Beard* 471 (A, Trin), 472 (A, Trin), April 20, 1945 (trees 10 m. high; trunk 30 cm. diam.; bark soft and stringy).

Of the cited specimens, no. 147 bears flowers and is accompanied by detached immature fruits, no. 471 bears immature fruits, and no. 472 has mature fruits from which the above dimensions are taken. Although there seems no doubt that a single species is represented by these collections, it should be noted that the leaves of no. 472 are on the average considerably larger than those of the other two numbers, although smaller leaves also occur on this specimen. The number of secondary nerves is also greater in the leaves of no. 472. In general, the maximum dimensions given above pertain to this specimen, the smaller dimensions to nos. 147 and 471. The variation present seems normal for a species of *Eschweilera* and may be due to conditions of shade or exposure.

The differences between the new species and the common lowland species of Trinidad, *E. subglandulosa*, are obvious, the two even falling into different genera if the classifications of Miers and Knuth are adopted. Among the species of *Eschweilera* with predominantly 4 ovary-locules (*Chytroma* Miers), our plant seems closest to *E. decolorans* Sandwith, of lowland British Guiana, of which we have several specimens for comparison (*Sandwith* 348 [type coll., NY, US], 414 [NY], *Jenman* 2474 [NY], *Forest Dept.* 920 [ICTA], 2563 [NY]). From *E. decolorans*, *E. trinitensis* differs primarily in having its inflorescence narrowly paniculate rather than usually simply racemose, in having its pedicels shorter, articulate at the base, and ebracteolate rather than articulate above the base and with obvious bracteoles, and in its smaller flowers (this character being obvious in dimensions of the sepals, petals, filaments, staminodes, and ovary). The petals of *E. decolorans* are said to be pure white or creamy white, while those of the new species are distinctly yellow. In foliage the two species are essentially similar, but the leaf-blades of *E. trinitensis* have the secondary nerves more closely approaching the margin and there weakly anastomosing by means of inconspicuous connecting nerves, while the blades of *E. decolorans* have the secondaries more distinctly interconnected somewhat farther from the margin. The proportions of the pyxidia of the two species provide further distinguishing features; for a discussion of the fruits of *E. decolorans* see our note under *E. Sandwithiana*, described below.

The character upon which *Chytroma* is separated from *Eschweilera* (cf. Knuth in *Pflanzenz.* 105 [IV. 219a]. 1939) — the presence of 4 rather than 2 ovary-locules — often seems to separate closely related species and furthermore is not always dependable, as already pointed out by Eyma (*Polygon.*, Gutt., *Lecyth.* Surinam 66, 1932).

Eschweilera trinitensis ("mountain guatecare") is a medium-sized evergreen tree up to 20 m. in height, with a trunk up to 75 cm. in diameter. Its trunk is usually short and thick, slightly buttressed, and with heavy

and spreading branches. The bark is dark gray to black, smooth, soft and fibrous, and about 1 cm. thick on old trees. The wood is white, close-grained and moderately hard, with no distinct heartwood. As the tree occurs only in fairly inaccessible places, the timber is never worked and nothing is known of its quality.

This species is one of the principal dominants in the montane rain-forest which is localized at the summits of the two highest peaks in the Northern Range of Trinidad — Tucuche and Aripo — above 800 m. elevation. The tree is unknown elsewhere in Trinidad, its distribution being confined to an area of only several hundred acres. The second author believes that he has seen it in forest of a similar type in the mountains of the Paria Peninsula of Venezuela, a range formerly continuous with the Northern Range of Trinidad, but this occurrence is not at present supported by herbarium specimens.

Enumerations show this species to occur at an average rate of 15 trees per acre over 10 cm. in diameter in the montane rain-forest — a figure representing about 16% of the crop. It ranks third in numbers in the association, *Licania biglandulosa* Griseb. and *Richeria grandis* Vahl being each slightly more abundant. The *Eschweilera*, however, grows to be a bigger tree than any of its associates. Other less common members of the association are *Oreopanax capitatus* (Jacq.) Dec. & Planch., *Croton roraimensis* Croizat, *Chimarrhis cymosa* Jacq., *Euterpe Broadwayana* Becc., *Prestoea pubigera* (Griseb. & Wendl.) Nichols., and *Cyathia* spp.

There are no exact data on the habitat of *Eschweilera trinitensis*. It occurs on mountain tops in the cloud belt, where the atmosphere is generally saturated. Annual rainfall is probably about 5000 mm. without any appreciable dry season, and average temperature is about 65° F. The constant wetness is shown by a thick covering of bryophytes on the trees, by luxuriant epiphytes, and by the presence of tree-ferns. The area is exposed to strong winds.

Eschweilera sp.

TRINIDAD: Blanchisseuse Reserve, R. L. Brooks 12483 (NY); Northern Range Reserve, Brooks 12687 (NY).

What appears to be a third species of *Eschweilera* from Trinidad is represented by the above-cited specimens. The leaf-blades of this entity are smaller than those of either *E. subglandulosa* or *E. trinitensis*, measuring 7–11 × 3–5 cm., obtuse to acute at base, with the 7–10 secondaries weakly anastomosing and the veinlet-reticulation very intricate. A single fruit accompanying no. 12483 resembles those of *E. trinitensis* but is smaller, with a thinner pericarp and a single 1-seeded locule. Collection of flowers is desired before this form can confidently be placed.

This species of *Eschweilera*, locally known as "guatecare petite feuille." is a large evergreen tree up to 30 m. in height, with a long cylindrical erect trunk up to 60 cm. (or occasionally more) in diameter, branching high up, and with very small buttresses. The bark is dark gray, somewhat smooth, about 0.5 cm. thick, soft, and somewhat fibrous. The wood is

white, of moderate hardness, and reputedly of poor durability, for which reason it is only very seldom worked for timber. It is occasional in the lower montane rain-forests of the *Byrsonima-Licania* association in the Northern Range of Trinidad, at elevations between 250 and 750 m.

TABLE 2.

NUMERICAL OCCURRENCE OF *ESCHWEILERA* SP. IN BYRSONIMA-LICANIA ASSOCIATION OF NORTHERN RANGE OF TRINIDAD; INDIVIDUALS PER 100 ACRES

Number of trees in girth classes (girth in feet)										
1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	over 10	Totals
96	78	57	45	36	12	12	4	2	3	345

Eschweilera sp. ("guatecare petite feuille") ranks eighth in number among the dominant trees and represents about 2% of the total crop. The associate dominants are *Licania ternatensis* Hook. f., *Sterculia caribaca* R. Br., *Byrsonima spicata* (Cav.) L. C. Rich., *Licania biglandulosa* Griseb., *Micropholis Cruegeriana* Pierre, *Terminalia amazonia* (J. F. Gmel.) Exell, and *Diospyros ierensis* Britton. The habitat of this *Eschweilera* is essentially the same as that of the next species discussed, *E. Sandwithiana*.

Eschweilera Sandwithiana sp. nov.

Eschweilera decolorans sensu Williams, Fl. Trin. & Tobago 1: 354. 1934; non Sandwith.

Arbor alta ubique glabra, ramulis subteretibus striatis gracilibus apicem versus 1.5-3 mm. diametro purpurascens vel cinereis demum inconspicue lenticellatis; petiolis validis (2-3 mm. diametro) rugulosis supra complanatis 5-20 mm. longis; laminis valde chartaceis in sicco olivaceis vel fuscis ellipticis vel oblongo-ellipticis, (11-) 17-25 cm. longis, (3-) 6-10.5 cm. latis, basi acutis vel obtusis et interdum subrotundatis, in apicem 7-15 mm. longum subito cuspidatis vel acuminatis, margine leviter revolutis et inconspicue undulato-crenatis vel integris, costa valida utrinque prominente, nervis secundariis utrinque 11-15 patentibus leviter curvatis 3-7 mm. e margine regulariter et conspicue anastomosantibus supra leviter subtus valde elevatis, rete venularum intricato copioso utrinque valde prominulo; inflorescentia supra-axillari vel subterminali breviter racemosa sub anthesi 1-2 cm. longa ut videtur 5-8-flora, rhachi angulata striata 1-1.5 mm. diametro, floribus magnis; pedicellis crassis (sub anthesi 1.5-3 mm. diametro) teretibus 6-9 mm. longis superne incrassatis, basim versus articulatis haud bracteolatis, parte inferiore subnulla; sepalis (5 vel) 6 sub anthesi patentibus valde imbricatis coriaceis late ovatis vel suborbicularibus, 5-7 mm. longis, 4.5-8 mm. latis, apice rotundatis, margine interdum scariosis; petalis in sicco papyraceis suborbicularibus vel elliptico-obovatis, sub anthesi 15-20 mm. longis et 13-17 mm. latis, obscure reticulato-nervis, apice rotundatis; androphoro explanato sub anthesi ad 4 cm. longo, ligula carnosa 2-2.5 cm. longa super annulo 1.5-2 cm. lata, galea spiraliter incurvata compacte subglobosa 15-18 mm.

diametro, parte apicali inflexa extus appendiculis crassis lanceolatis 5-6 mm. longis copiose ornata; staminibus circa annulum carnosum et paulo supra numerosissimis, filamentis carnosis clavatis longitudine diversis (0.5-3 mm. longis, eis basi ligulae longioribus) interdum anantheris, antheris oblongo-ellipsoideis, thecis 0.5-0.7 mm. longis; ovario plus minusve semisupero sub anthesi circiter 3.5 mm. diametro, in stylum crassum subconicum obtusum circiter 1.5 mm. longum producto, pariete crasso. loculis 2 vel 3, ovulis in quoque loculo 4-7 e basi erectis obovoideo-complanatis; inflorescentia sub fructu ut videtur paulo incrassata, pyxidio submaturo depresso-subgloboso ad 3 cm. longo et 3.5 cm. lato, parte infracalycari inconspicua complanata, calycis lobis coriaceis persistentibus, vitta interzonalis erecto-patente 5-10 mm. alta, operculo convexo-subconico 10-15 mm. alto ad 35 mm. diametro, pericarpio lignoso 2-5 mm. crasso ruguloso ut videtur plerumque 1- vel 2-loculari, seminibus paucis.

TOBAGO: Roxborough, in the Forest Reserve near the 5-mile post, *I. S. Earle 12899* (Trin, TYPE), May 16, 1933 (*devilwood* or *guatecare*); Roxborough-Bloody Bay Road, Tobago Reserve, alt. about 300 m., *C. Swabey 12941* (Trin) (*devilwood*); King's Bay Estate, *W. E. Broadway 4534* (NY); without definite locality, *R. C. Marshall 12383* (Trin) (big tree).

Although the above specimens are far from satisfactory, taken together they offer enough material to indicate that the Tobago plant is distinctly different from any encountered in Trinidad; furthermore, we are unable to match this with any continental species and therefore we have described it as new. The best flowers accompany the type, while *Swabey 12941* has the best (although broken and not fully mature) fruits. *Broadway 4534* has the only attached inflorescences, but its flowers are immature. This Broadway specimen was cited by Knuth (in *Pflanzenr.* 105 [IV. 219a] : 99. 1939) as *E. laevifolia*, but it is certainly distinct from that species, discussed above as *E. subglandulosa*.

Eschweilera Sandwithiana is characterized by its large and comparatively narrow acuminate leaf-blades, of which the secondary nerves are united in very regular anastomoses and the veinlet-reticulation is intricate and conspicuous on both surfaces. The fruit of the new species is notable for its small nearly flat infracalycary zone, its spreading interzonal band, and its large operculum. In having a 2- or 3-celled ovary our plant is referable to *Eschweilera* in the limited sense rather than to *Chytroma*, if indeed these two groups are worthy of even sectional recognition.

Obvious characters of leaf-texture and venation distinguish the new species from *E. subglandulosa* (Steud.) Miers. Furthermore, *E. Sandwithiana* has the inflorescence simple and compact rather than divaricately paniculate, the sepals larger, probably the androecial parts also larger at anthesis, and the fruit quite differently shaped.

From *E. decolorans* Sandwith and the above described *E. trinitensis*, the new species differs in its fewer ovary-locules with more numerous ovules, its compact inflorescence, and in minor characters of foliage and flowers. In venation, the leaves of the new species are more suggestive of those of *E. decolorans*, which has a similarly obvious veinlet-reticulation, but our plant has the anastomoses of the secondaries more regular.

Prof. E. E. Cheesman, of the Imperial College of Tropical Agriculture, Trinidad, has kindly loaned us some detached fruits said to be those of *E. decolorans* and presumably from British Guiana. These mature pyxidia, like those of our new species, have a very small flat infracalycary zone (2-3 cm. in diameter), a conspicuous calycary ridge with thickened calyx-lobes, a spreading interzonal band 2-3 cm. high and 5-6.5 cm. in diameter at the much-thickened apex, and a convex operculum 1.5-2 cm. high and up to 6 cm. in diameter. The pericarp is 5-10 mm. thick, and the number of locules varies from 1 to 4, being 3 or 4 in the largest fruits. These pyxidia are essentially similar to those of the new species in proportions, being quite different from those of *E. subglandulosa* and *E. trinitensis*.

It is a pleasure to dedicate this species to Mr. N. Y. Sandwith, of the Royal Botanic Gardens, Kew, in recognition of his valuable work on the flora of Trinidad and Tobago and his interest in the Lecythidaceae.

Eschweilera Sandwithiana is a medium-sized evergreen tree up to 25 m. in height, but usually smaller, with a trunk up to 60 cm. in diameter or occasionally more. The trunk is short, heavily buttressed, and branching low down or with abundant epicormics. The bark is about 1 cm. thick, soft, black, fibrous, and stringy, with a yellowish blaze. The wood is tough, white, of medium hardness, and reputedly of very poor durability. It is never cut for timber owing to its bad reputation.

"Devilwood" is an abundant tree in two of the three types of rain-forest occurring in Tobago (see Beard in Ecol. Monogr. 14: 135-163. 1944; in that paper the Tobago "devilwood" was discussed as *E. decolorans* Sandwith). It is abundant in rain-forest of the *Carapa-Andira* association and in lower montane rain-forest of the *Byrsonima-Licania* association, but it is absent from the xerophytic rain-forest of the *Manilkara-Guettarda* association, which occurs on igneous soil.

TABLE 3.

NUMERICAL OCCURRENCE OF *ESCHWEILERA SANDWITHIANA* IN FOREST TYPES
IN TOBAGO; INDIVIDUALS PER 100 ACRES

Association	Number of trees in girth classes (girth in feet)										Totals
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	over 10	
<i>Carapa-Andira</i>	100	180	320	140	120	120	40	40	—	—	1060
<i>Byrsonima-Licania</i>	170	230	220	120	40	80	10	20	—	10	900

Eschweilera Sandwithiana ranks fourth in numbers among the dominants in both associations and forms 7% of the total number of trees over 1 ft. in girth in both cases. In the *Carapa-Andira* association its principal associates are *Carapa guianensis* Aubl., *Andira inermis* (Wright) H. B. K.,

Hieronyma caribaea Urban, *Viola surinamensis* (Rol.) Warb., *Euterpe* sp., and *Tresanthera pauciflora* (Solereeder) K. Schum. In the *Byrsonima-Licania* association there are *Byrsonima spicata* (Cav.) L. C. Rich., *Licania biglandulosa* Griseb., *Ternstroemia oligostemon* Krug & Urban, *Sloanea trinitensis* Sandwith, *Euterpe* sp., and *Hirtella racemosa* Lam.

The two forest types in which the Tobago *Eschweilera* is found occur on the deep red to yellow clays developed over the schist formation. These are fairly permeable, well-drained, moisture-retentive soils with abundant root-room. The two types are differentiated by altitude, the *Carapa-Andira* association being the taller and more luxuriant, occurring at the lower levels (120-360 m.) and in more sheltered positions. The *Byrsonima-Licania* association ranges from 360 to 580 m. and is more exposed to strong winds. "Devilwood" avoids the shallow gray soil developed over the igneous formation, which lacks root-room and is physiologically dry. Rainfall of the area is probably 2500 to 3700 mm. annually, without any effective dry season.

GENERAL NOTES

Eschweilera subglandulosa is quite distinct from the other three species discussed, all of which are evidently closely related; it is a tree of the lowlands, with a hard brittle bark and heavy durable timber. This species is also known from Guiana and it has probably arrived in Trinidad since the Pleistocene by migration from that direction. The other three species are trees of montane forests; they have a soft stringy bark and timber of poor quality. One (*E. Sandwithiana*) is endemic to Tobago, another (*E. sp.*) to Trinidad, and the third (*E. trinitensis*) probably to Trinidad and the Paria Peninsula of Venezuela. These three are evidently derived from a flora of an ancient Parian land-mass which formerly united all the ranges in the system, now separated by sea. The flora of Tobago indicates continental origin, with isolation for a fairly long period. Probably all three of these *Eschweilerae* are to be considered as derivatives of a single population in the Parian flora.

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